PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in a Casting Method of Producing Metal Ingots having Homogeneous and Smooth Surfaces

I, SHIGEYUKI OKAZAKI, a Japanese Subject, of No. 12, Matsu-naga-cho, 3-Jo-Agaru, Tominokoji, Nakakyo-ku, Kyoto City, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the production of metal castings including ingots and is concerned with the production of casting moulds.

The invention provides a method of treatment of the inner walls of either sand or metal casting moulds with a view to protecting the mould and giving an improved finish to the castings.

As is well known, at the surface of the cast metal in contact with the mould various complicated conditions occur such as surface chill of the metal, fusion penetration and abnormal flow of the molten metal causing deterioration of the finish of the ingot or casting and it is a particular object of the present invention to remedy these drawbacks in metal casting.

According to the present invention a method is provided of treating the inner walls of metal casting moulds, including ingot moulds, by applying a composition to the said walls which at the temperature of the molten metal will decompose and provide a protecting film between the metal and the walls of the mould, which method is characterised in that the composition applied to the walls of the mould comprises a fluorine-containing compound, a metallic reducing agent in powder form and a binder together with a liquid vehicle for said constituents.

The invention includes metal castings when produced in moulds treated as above described.

When molten metal is poured into a mould according to the invention, the facing material is decomposed in contact with this molten metal producing various heat insulating materials which becoming molten or gaseous at the high temperature of the molten metal are distributed over the cast metal in the form of a liquid or gaseous film. This heat insulating film, acting as a protector of the metal surface, prevents surface chill and fusion penetration which are inevitable in any known method so that the ingot can be finished with its surface homogeneous in structure and with a fine smooth texture.

The fluorine-containing compound is preferably a fluorocarbon resin of which the best known is polytetrafluoroethylene, but other fluorine-containing compounds may be employed. Cerium fluoride, calcium fluoride or cryolite may be used although with not so good results as with a fluorocarbon resin. The fluorocarbon resin may be used in the form of a dispersion of the powdered resin in water or naphtha.

The metal reducing agent may be any of the metals aluminium, magnesium, calcium, barium, manganese, zirconium, titanium, molybdenum and tungsten and for the purposes of this specification silicon is to be regarded as a metallic reducing agent.

The binder must be a substance soluble or capable of swelling in the vehicle in which the other ingredients are dispersed and capable of producing a stable film when dried and also capable of adhering firmly to the inner surface of the mould and decomposable by the heat of the molten metal. Suitable binders are sodium alginate, molasses, starch, carboxymethyl cellulose and any natural or synthetic organic polymer, sodium silicate, silica gel and other inorganic compounds.

The liquid vehicle for the dispersion of the ingredients of the composition may be water, benzol, acetone, naphtha, alcohol, ether or

other organic solvent normally used as a thinner for paints.

The ingredients composing the composition according to the invention protect both the cast metal and the mould; being decomposed into an insulating film and being very highly chemically active they act as a cleanser of the cast metal in the reactions taking place as a result of the decomposition.

Castings produced in moulds treated according to the invention not only have a fine finish but it is not necessary to strip off any skin or scrape off a chilled layer and furthermore the life of the mould is prolonged.

The facing material according to the invention can be used in any desirable form, e.g. liquid or grease according to the vehicle chosen and can be employed in casting of various kinds of metal including steel, copper alloys and aluminium alloys.

The following is an example in which is shown the preferred embodiment of the present invention.

EXAMPLE

A composition for the facing material according to the invention in steel casting is made by mixing one part by weight of fluorocarbon resin and three parts by weight of the following mixture:—

	Percentage (by weight)
Al powder	15
Mn powder	5
Ti powder	3
Binder	10
Solvent (thinner, alcohol, acetone, etc.)	67

The mixture is applied as a coating over the entire inner surface of the mould and dried. Then molten steel is poured into the mould. The surface of the finished steel ingot after cooling has a fine smooth texture, glistening in dark like silver, and there cannot be found any fusion penetration nor chilled parts. Neither cavities, bubble holes nor any other flaws in structure were recognised through x-ray test. The rolling property of the ingot is very good without stripping the black skin therefrom. The life of a metallic mould can be prolonged twice the normal period. The analytical result of gases contained in the surface layer of the ingot is as follows:—

Hydrogen	0.0006%
Nitrogen	0.006%
Oxygen	0.0032%
Carbon	0.03%

A 1 ton steel ingot will require 360 gm. of the coating composition according to the invention containing 75 gm. of fluorocarbon resin.

Said facing material can be used for casting chromium steel, nickel-chromium steel and manganese steel, with equally good results. When cerium fluoride, calcium fluoride or cryolite is used as the thermal decomposable fluorine-containing material in place of said fluorocarbon resin, the result is nearly the same.

WHAT I CLAIM IS:—

1. A method of treating the inner walls of metal casting moulds, including ingot moulds, by applying a composition to the said walls which at the temperature of the molten metal will decompose and provide a protecting film between the metal and the walls of the mould, characterised in that the composition applied to the walls comprises a fluorine-containing compound, a metallic reducing agent in powder form, a binder and a liquid vehicle for the said constituents.

2. A method as claimed in Claim 1, wherein the fluorine-containing compound is a fluorocarbon resin and the liquid vehicle is alcohol or acetone.

3. A method of treating the inner walls of metal casting moulds as claimed in Claim 1 or Claim 2, wherein the metal powder comprises mainly aluminium powder.

4. A method of treating the inner walls of metal casting moulds as claimed in any one of the preceding claims, wherein the binder employed is sodium alginate or carboxymethyl cellulose.

5. A method of treating the inner walls of metal casting moulds substantially as hereinbefore described.

6. Metal castings when produced in casting moulds treated by the method claimed in any one of the preceding claims.

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